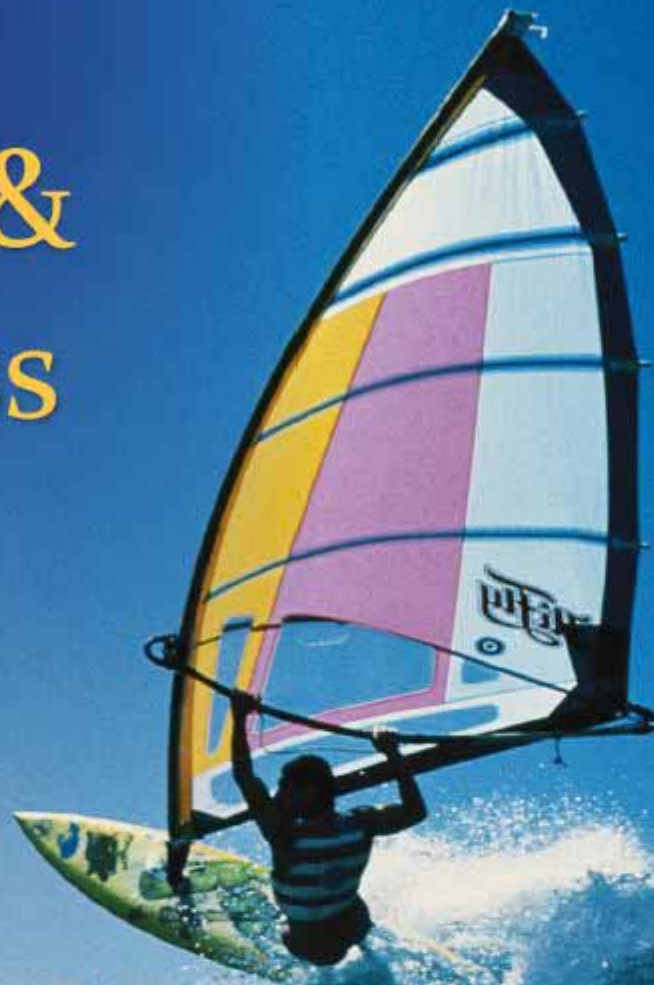


11th Edition

# Fitness & Wellness



Werner W. K. Hoeger  
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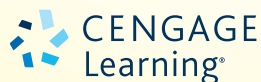
ELEVENTH EDITION

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Boise, Idaho



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# Preface

Most people go to college to learn how to make a living. Making a good living, however, won't help them unless they live a wellness lifestyle that will allow them to enjoy what they have. Unfortunately, the current American lifestyle does not provide the human body with sufficient physical activity to enhance or maintain adequate health. As a result, the importance of sound fitness and wellness programs has taken on an entirely new dimension.

Science has clearly determined that a lack of physical activity is detrimental to health. In fact, the office of the Surgeon General has identified physical fitness as a top health priority by stating that the nation's top health goals include exercise, increased consumption of fruits and vegetables, smoking cessation, and the practice of safe sex. All four of these fundamental healthy lifestyle factors are addressed in this book.

Many of the behaviors we adopt in life are a product of our environment. Currently, we live in a "toxic" health/fitness environment. We are so habituated to our modern-day environment that we miss the subtle ways it influences our behaviors, personal lifestyles, and health each day. The epidemic of physical inactivity and obesity that is sweeping across America is so harmful to health that it actually increases the deterioration rate of the human body and leads to premature aging, illness, and death.

Only about one-half of the adults in the United States meet the recommended amount of weekly aerobic physical activity, whereas less than a fourth meet the guidelines for muscular (strength) fitness. Among those who meet the guidelines, many do not reap the full benefits because they simply do not know how to implement and stay with a sound program that will yield desirable results.

The good news is that lifetime wellness is within the grasp of most people. We know that most chronic and debilitating conditions are largely preventable. Scientific evidence has shown that improving the quality and most likely the length of our lives is a matter of personal choice.

This book offers you the necessary information to start on your path to fitness and wellness by adhering to a healthy lifestyle. The information in the following chapters and the subsequent activities at the end of each chapter will enable you to develop a personal program that promotes lifetime fitness, preventive health care, and personal wellness. The emphasis throughout the book is teaching you how to take control of your lifestyle habits so that you can do what is necessary to stay healthy and realize your optimal well-being.

## What the Book Covers

As you study this book and complete the respective activities, you will learn to:

- understand the importance of good physical fitness and a wellness lifestyle in the achievement of good health and quality of life and a more productive and longer life.
- determine whether medical clearance is needed for your safe participation in exercise.
- learn behavior modification techniques to help you adhere to a lifetime fitness and wellness program.
- assess the health-related components of fitness (cardio-respiratory endurance, muscular strength and endurance, muscular flexibility, and body composition).
- write exercise prescriptions for cardiorespiratory endurance, muscular strength and endurance, and muscular flexibility.
- analyze your diet and learn the principles that govern sound nutrition.
- develop sound diet and weight-management programs.
- understand stress, lessen your vulnerability to stress, and implement a stress management program if necessary.
- implement a cardiovascular disease risk-reduction program.
- follow guidelines to reduce your personal risk of developing cancer.
- implement a smoking cessation program, if applicable.
- understand the health consequences of chemical dependency and irresponsible sexual behaviors and learn guidelines for preventing sexually transmitted infections.
- discern between myths and facts of exercise and health-related concepts.

## New in the Eleventh Edition

All nine chapters in the 11th edition of *Fitness & Wellness* have been revised and updated according to recent advances published in the scientific literature and information reported at professional health, fitness, wellness, and sports medicine conferences. In addition to the individual chapter updates listed below, several new figures and photographs are included in this edition. The following are the most significant chapter updates:

- All pertinent statistics related to the leading causes of death and life expectancy in the United States have been brought up to date in Chapter 1, *Introduction to Physical Fitness and Wellness*. The number of Americans who meet the 2008 federal guidelines of aerobic and strength-training activities and the role of core values and the environment in being able to change lifestyle behaviors are also included in this introductory chapter.
- The waist-to-height ratio (WHtR) has been included in Chapter 2, *Assessment of Physical Fitness*. The WHtR is a new health risk assessment that is used to ascertain the health risks of obesity and appears to predict disease risk (including multiple coronary heart disease risk factors) and premature mortality more effectively than body mass index and waist circumference.
- Minor changes were made to Chapter 3, *Exercise Prescription*, to ensure it conformed with the 2011 American College of Sports Medicine (ACSM) position paper on the “Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory, Musculoskeletal, and Neuromotor Fitness in Apparently Healthy Adults” and the newly released ninth edition (2014) of the ACSM’s Guidelines for Exercise Testing and Prescription. Included also is the principle of exercise volume under cardiorespiratory endurance prescription and new information on bacterial-infection back pain.
- Chapter 4, *Evaluating Fitness Activities*, has been reorganized into *Traditional Fitness Activities* and *New Fitness Trends*. Among the new activities included are functional fitness, stability exercise balls, body-weight training, the resurgence of circuit training, and high-intensity circuit training (HICT).
- Chapter 5, *Nutrition for Wellness*, was updated and revised to include new material on sugar-sweetened beverages and energy drinks; unsaturated fatty acids (including omega-3s, omega-6s, and omega-9s); the key role of adequate protein intake throughout the day for health, physical performance, and weight management; complementary proteins for vegetarian diets; and red-meat intake and premature death.
- Important changes related to the recommendations and advances in the field regarding weight loss and proper weight control were added to Chapter 6, *Weight Management*. The data on the obesity epidemic in the United States now includes obesity prevalence estimates based on gender, level of education, and cultural ethnicity. Enhancements were also

made to the *Principles of Weight Management*, including a better explanation on the rule of thumb that one pound of fat represents 3,500 calories; popular diets on the market today; a new section on the *Overweight and Fit Debate* (fit and fat); the value of having three regular meals and two healthy snacks daily; the importance of adequate amount of lean protein sources with each meal; and the benefits of exercise intensity and interval training.

- Information on the damaging effects of stress on the body has been added to Chapter 7, *Stress Management*. A new *Hostility Questionnaire* to identify Type A individuals who maybe at higher risk for disease has been added to the chapter.
- The incidence and mortality rates for cardiovascular disease and cancer have been brought up to date in Chapter 8, *A Healthy Lifestyle Approach*. Content updates were made to several individual risk factors for heart disease and the cancer prevention guidelines. The questionnaires for cardiovascular disease and cancer prevention presented in Activity 8.1 were also revised, and new information on spice (under the *Substance Abuse* section), genital herpes, and advances in HIV treatment have all been added to the chapter.
- Several new questions and updates to others were added to Chapter 9, *Relevant Fitness and Wellness Issues*. Among new questions included in the chapter are topics related to the difficulty in changing dietary habits, detox diets, gluten sensitivity, and fish and mercury toxicity. Additional updates were included in the questions related to energy drinks, advances in the prevention and treatment of osteoporosis, and exercise and weight loss.

## Ancillaries

- **Health MindTap for Fitness & Wellness.** Instant Access Code, ISBN-13: 978-1-285-77642-2.
- MindTap is well beyond an eBook, a homework solution or digital supplement, a resource center website, a course delivery platform, or a Learning Management System. More than 70% of students surveyed said it was unlike anything they have seen before. MindTap is a new personal learning experience that combines all your digital assets—readings, multimedia, activities, and assessments—into a singular learning path to improve student outcomes.
- **Diet & Wellness Plus.** The Diet & Wellness Plus App in MindTap helps you gain a better understanding of how nutrition relates to your personal health

goals. It enables you to track your diet and activity, generate reports, and analyze the nutritional value of the food you eat! It includes over 55,000 foods in the database, custom food and recipe features, the latest dietary references, as well as your goal and actual percentages of essential nutrients, vitamins, and minerals. It also helps you to identify a problem behavior and make a positive change. After completing the Wellness Profile Questionnaire, Diet & Wellness Plus will rate the level of concern for eight different areas of wellness, helping you determine the areas where you are most at risk. It then helps you put together a plan for positive change by helping you select a goal to work toward—complete with a reward for all your hard work.

- The Diet & Wellness Plus App is accessed from the App dock in MindTap and can be used throughout the course for students to track their diet and activity and behavior change.
- There are activities and labs in the course that have students access the App to further extend learning and integrate course content.
- **Instructor Companion Site.** Everything you need for your course in one place! This collection of book-specific lecture and class tools is available online via [www.cengage.com/login](http://www.cengage.com/login). Access and download PowerPoint presentations, images, instructor's manual, videos, and more.
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- **Global Health Watch.** Instant Access Code, ISBN-13: 978-1-111-37733-5. Printed Access Card, ISBN-13: 978-1-111-37731-1. Updated with today's current headlines, Global Health Watch is your one-stop resource for classroom discussion and research projects. This resource center provides access to thousands of trusted health sources, including academic journals, magazines, newspapers, videos, podcasts, and more. It is updated daily to offer the most current news about topics related to your health course.
- **Workbook for Becoming Physically Fit: A Physical Education Multimedia Course.** ISBN-13: 978-1-133-49092-0. Becoming Physically Fit is a telecourse produced by the DALLAS Tele-

Learning of the LeCroy Center for Educational Telecommunications. This self-paced course is designed to encourage students to improve their personal physical fitness and obtain an overall healthier lifestyle. Students are asked to make behavioral and physical changes to their lifestyle. The successful implementation of these changes serves to motivate students to maintain personal fitness, proper nutrition, and lifelong healthy lifestyle choices. For more information on the course, visit <http://telelearning.dcccd.edu>.

- **Careers in Health, Physical Education, and Sports, 2e.** ISBN-13: 978-0-495-38839-5. This unique booklet takes students through the complicated process of picking the type of career they want to pursue; explains how to prepare for the transition into the working world; and provides insight into different career paths, education requirements, and reasonable salary expectations. A designated chapter discusses some of the legal issues that surround the workplace, including discrimination and harassment. This supplement is complete with personal development activities designed to encourage students to focus on and develop better insight into their futures.
- **Walk4Life® Pedometer.** ISBN-13: 978-0-495-01315-0. Provided through an alliance with Walk4Life, the Walk4Life Elite Model pedometer tracks steps, elapsed time, and distance. A calorie counter and a clock are included in this excellent class activity and tool to encourage students to track their steps and walk toward better fitness awareness.

## Acknowledgments

*Fitness & Wellness*, 11th edition, was made possible through the contributions of many individuals. In particular, we would like to express our gratitude to the reviewers of the 11th edition. Their valuable comments and suggestions are most sincerely appreciated.

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## Brief Author Biographies

**Werner W. K. Hoeger** is a professor emeritus of the Department of Kinesiology at Boise State University. He served as a graduate teaching assistant at Brigham Young University–Provo and later held faculty appointments at the University of the Andes in Venezuela and the University of Texas of the Permian Basin. He remains active in research and continues to lecture in the areas of exercise physiology and physical fitness and wellness. During the 2012–2013 academic year, he served as an adjunct professor of exercise science at Brigham Young University–Hawaii.

Dr. Hoeger completed his undergraduate and master’s degrees in physical education at the age of 20 and received his doctorate degree with an emphasis in exer-

cise physiology at the age of 24. He is a *Fellow* of the *American College of Sports Medicine* and also of the *Research Consortium of the American Alliance for Health, Physical Education, Recreation, and Dance*. In 2002, he was recognized as the *Outstanding Alumnus* from the *College of Health and Human Performance* at *Brigham Young University*. He is the recipient of the first *Presidential Award for Research and Scholarship* in the *College of Education* at *Boise State University* in 2004. In 2008, he was asked to be the *keynote speaker* at the *VII Iberoamerican Congress of Sports Medicine and Applied Sciences* in Mérida, Venezuela, and was presented with the *Distinguished Guest of the City* recognition. In 2010, he was also honored as the *keynote speaker* at the *Western Society for Kinesiology and Wellness* in Reno, Nevada.

Dr. Hoeger uses his knowledge and personal experiences to write engaging, informative books that thoroughly address today’s fitness and wellness issues in a format accessible to students. Since 1990, he has been the most widely read fitness and wellness college textbook author in the United States. He has published a total of 58 editions of his nine fitness and wellness-related titles. Among the textbooks written for Wadsworth/Cengage Learning are *Principles and Labs for Fitness and Wellness*, 12th edition; *Lifetime Physical Fitness & Wellness*, 13th edition; *Principles and Labs for Physical Fitness*, ninth edition; *Wellness: Guidelines for a Healthy Lifestyle*, fourth edition; and *Water Aerobics for Fitness and Wellness*, fourth edition (with Terry-Ann Spitzer Gibson).

Dr. Hoeger was the first author to write a college fitness textbook that incorporated the “wellness” concept. In 1986, with the release of the first edition of *Lifetime Physical Fitness & Wellness*, he introduced the principle that to truly improve fitness, health, and quality of life and to achieve wellness, a person needed to go beyond the basic health-related components of physical fitness. His work was so well received that every fitness author immediately followed his lead.

As an innovator in the field, Dr. Hoeger has developed many fitness and wellness assessment tools, including fitness tests such as the Modified Sit-and-Reach, Total Body Rotation, Shoulder Rotation, Muscular Endurance, Muscular Strength and Endurance, and Soda Pop Coordination Tests. Proving that he “practices what he preaches,” he was the oldest male competitor in the 2002 Winter Olympics in Salt Lake City, Utah, at the age of 48. He raced in the sport of luge along with his then 17-year-old son, Christopher. It was the first time in Winter Olympics history that father and son com-

peted in the same event. In 2006, at the age of 52, he was the oldest competitor at the Winter Olympics in Turin, Italy. Most recently, he raced in the 800-, 1,500-, and 5,000-meter events in track and field at the 2011 World Masters Athletic Championships held in Sacramento, California. In 2012, he reached All-American standards for his age group by USA Track and Field in the 1,500-meter event.

**Sharon A. Hoeger** is vice president of Fitness & Wellness, Inc., of Boise, Idaho. Sharon received her degree in computer science from Brigham Young University where she was also a member of the intercollegiate gymnastics team. She served as an adjunct faculty at the University of Texas of the Permian Basin and taught introductory computer programming and statistics. She is extensively involved in the research process used in retrieving the most current scientific information that goes into the revision of each textbook. She is also the author of the software written specifically for the fitness and wellness textbooks. Her innovations in this area since the publication of the first edition of *Lifetime Physical Fitness & Wellness* set the standard for fitness and wellness computer software used in this market today.

Sharon is a coauthor in five of the seven fitness and wellness titles. She also served as Chef de Mission (Chief of Delegation) for the Venezuelan Olympic Team at the 2006 Winter Olympics in Turin, Italy.

Husband and wife are extremely active and they have been jogging and strength training together for more than 37 years. They are the proud parents of five children, all of whom are involved in sports and lifetime fitness activities. Their motto: “Families that exercise together, stay together.”



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# Introduction to Physical Fitness and Wellness

# 1



**Daily physical activity is the miracle medication that people are looking for. It makes you look and feel younger, boosts energy, provides lifetime weight management, improves self-confidence and self-esteem, and enhances independent living, health, and quality of life. It further allows you to enjoy a longer life by decreasing the risk of many chronic conditions, including heart disease, high blood pressure, stroke, diabetes, some cancers, and osteoporosis.**

## Objectives

- Understand the importance of lifetime fitness and wellness.
- Learn the recommended guidelines for weekly physical activity.
- Define physical fitness and list components of health-related and skill-related fitness.
- Understand the benefits of a comprehensive fitness and wellness program.
- Learn motivational and behavior modification techniques to enhance compliance with a healthy lifestyle program.
- Learn to write SMART goals to aid with the process of change.
- Determine whether medical clearance is required for safe participation in exercise.

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## Real Life Story | Jordan's Experience

Last year as a freshman in college I was advised to enroll in a general ed fitness and wellness course. I played high school sports and thought I knew all there was to know about being fit and in shape. As the course started, I realized I didn't really know how important it was to exercise regularly and take good care of myself. It quickly became my favorite class, and I couldn't wait to try what I was learning. I started cardio and strength workouts according to an exercise prescription I wrote myself. I didn't even know there was such a thing as an "exercise prescription." I even stretched once in a while and started to eat better. As I became more fit, I started to

feel better about myself, I lost weight, I toned up, I had so much more energy, and I actually started to enjoy exercise. It is fun to work out! I now know that how well I will live the rest of my life has a lot to do with wellness choices I make. My goal is to never stop exercising and take good care of myself.



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Most people believe school will teach them how to make a better living. A fitness and wellness course will teach you how to live better—how to truly live your life to its fullest potential. Real success is about more than money: Making a good living will not help you unless you live a wellness lifestyle that will allow you to enjoy what you have. Your lifestyle is the most important factor affecting your personal well-being, but most people don't know how to make the right choices to live their best life.

The benefits of an active and healthy lifestyle have been clearly substantiated by scientific evidence linking increased physical activity and positive habits to better fitness, health, and improved quality of life. Even though a few individuals live long because of favorable genetic factors, for most people, the quality of life during middle age and the "golden years" is more often related to wise

choices initiated during youth and continued throughout life.

Based on the abundance of scientific research on physical activity and exercise, a distinction has been established between **physical activity** and exercise. Physical activity is defined as bodily movement produced by skeletal muscles that requires the expenditure of energy and produces progressive health benefits. Examples of physical activity are walking to and from work and the store, taking the stairs instead of elevators and escalators, gardening, doing household chores, dancing, and washing the car by hand. Physical inactivity, by contrast, implies a predominantly sedentary lifestyle, characterized by excessive sitting throughout most days and a level of activity that is lower than that required to maintain good health.



Photos © Jonathan Hoeger

Physical activity and exercise lead to less disease, a longer life, and enhanced quality of life.

**Exercise** is considered a type of physical activity that requires planned, structured, and repetitive bodily movement to improve or maintain one or more components of physical fitness. A regular weekly program of walking, jogging, cycling, aerobics, swimming, strength training, and stretching exercises are all examples of exercise.

Unfortunately, the current way of life in most developed nations does not provide the human body with sufficient physical activity to maintain adequate health. Furthermore, many lifestyle patterns are such a serious threat to health that they actually speed up deterioration of the human body. In a few short years, lack of wellness leads to loss of vitality and gusto for life, as well as premature morbidity and mortality.

Even though most people in the United States believe a positive lifestyle has a great impact on health and longevity, most do not know how to implement a fitness and wellness program that will yield the desired results. Patty Neavill is an example of someone who frequently tried to change her life but was unable to do so because she did not know how to implement a sound exercise and weight control program. At age 24, Patty, a college sophomore, was discouraged with her weight, level of fitness, self-image, and quality of life in general.

She had struggled with weight most of her life. Like thousands of other people, she had made many unsuccessful attempts to lose weight. Patty put aside her fears and decided to enroll in a fitness course. As part of the course requirement, she took a battery of fitness tests at the beginning of the semester. Patty's cardiorespiratory fitness and strength ratings were poor, her flexibility classification was average, she weighed more than 200 pounds, and she was 41 percent body fat.

Following the initial fitness assessment, Patty met with her course instructor, who prescribed an exercise and nutrition program such as the one presented in this book. Patty fully committed to carry out the prescription. She walked or jogged five times a week, worked out with weights twice a week, and played volleyball or basketball two to four times each week. Her daily caloric intake was set in the range of 1,500 to 1,700 calories. She took care to meet the minimum required amounts from the basic food groups each day, which contributed about 1,200 calories to her diet. The remainder of the calories came primarily from complex carbohydrates. At the end of the 16-week semester, Patty's cardiorespiratory fitness, strength, and flexibility ratings all improved to the "good" category, she lost 50 pounds, and her percent body fat dropped to 22.5!

A thank-you note from Patty to the course instructor at the end of the semester read:

*Thank you for making me a new person. I truly appreciate the time you spent with me. Without your kindness and motivation, I would have never made it. It's great to be fit and trim. I've never had this feeling before and I wish everyone could feel like this once in their life.*

*Thank you, Your trim Patty!*

Patty never had been taught the principles governing a sound weight loss program. She needed this knowledge, and, like most Americans who have never experienced the process of becoming physically fit, she needed to be in a structured exercise setting to truly feel the joy of fitness.

Of even greater significance, Patty maintained her aerobic and strength-training programs. A year after ending her calorie-restricted diet, her weight actually increased by 10 pounds—but her body fat decreased from 22.5 percent to 21.2 percent. As discussed in Chapter 6, the weight increase is related mostly to changes in lean tissue lost during the weight-reduction phase. Despite only a slight drop in weight during the second year following the calorie-restricted diet, Patty's 2-year follow-up revealed a further decrease in body fat, to 19.5 percent. Patty understands the new quality of life reaped through a sound fitness program.

## 1.1 Lifestyle, Health, and Quality of Life

Research findings have shown that physical inactivity and negative lifestyle habits pose a serious threat to health. Movement and physical activity are basic functions for which the human organism was created. Advances in modern technology, however, have all but eliminated the need for physical activity in daily life. Physical activity no longer is a natural part of our existence. This epidemic of physical inactivity is the second greatest threat to U.S. public health and has been termed **Sedentary Death Syndrome**, or **SeDS**. (The number-one threat is tobacco use—the largest cause of preventable deaths.)

Today we live in an automated society. Most of the activities that

**Physical activity** Bodily movement produced by skeletal muscles that requires energy expenditure and produces progressive health benefits.

**Exercise** A type of physical activity that requires planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness.

**Sedentary Death Syndrome (SeDS)** Deaths that are attributed to a lack of regular physical activity.

used to require strenuous physical exertion can be accomplished by machines with the simple pull of a handle or push of a button. If people go to a store that is only a couple of blocks away, most drive their automobiles and then spend a couple of minutes driving around the parking lot to find a spot 10 yards closer to the store's entrance. During a visit to a multilevel shopping mall, nearly everyone chooses to ride the escalators instead of taking the stairs.

Automobiles, elevators, escalators, cell phones, intercoms, remote controls, electric garage door openers—all are modern-day commodities that minimize the amount of movement and effort required of the human body.

One of the most significant detrimental effects of modern-day technology has been an increase in **chronic diseases** related to a lack of physical activity. These include hypertension (high blood pressure), heart disease, diabetes, chronic low back pain, and obesity, among others. They sometimes are referred to as **hypokinetic diseases**. (“Hypo” means low or little, and “kinetic” implies motion.) Lack of adequate physical activity is a fact of modern life that most people can avoid no longer. According to the World Health Organization (WHO), chronic diseases account for almost 60 percent of all deaths worldwide and 43 percent of the global burden of disease.<sup>1</sup> If we want to enjoy contemporary commodities and still expect to live life to its fullest, a personalized lifetime exercise program must become a part of our daily lives.

With the developments in technology, three additional factors have changed our lives significantly and have had a negative effect on human health: nutrition, stress, and environment. Fatty foods, sweets, alcohol,

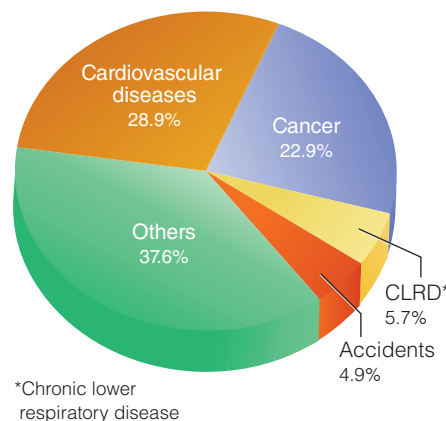
tobacco, excessive stress, and environmental hazards (such as wastes, noise, and air pollution) have detrimental effects on people's health.

The leading causes of death in the United States today (see Figure 1.1) are lifestyle-related. About 52 percent of all deaths in the United States are caused by cardiovascular disease and cancer.<sup>2</sup> Almost 80 percent of these deaths could be prevented by adhering to a healthy lifestyle. The third leading cause of death—chronic lower respiratory (lung) disease—is related largely to tobacco use. Accidents are the fourth leading cause of death. Even though not all accidents are preventable, many are. Fatal accidents often are related to abusing drugs and not wearing seat belts.

According to Dr. David Satcher, former U.S. surgeon general, more than 50 percent of the people who die in the United States each year die because of what they do. Estimates indicate that more than half of disease is lifestyle-related, a fifth is attributed to environmental factors, and a tenth is influenced by the health care the individual receives. Only 16 percent is related to genetic factors. Thus, the individual controls as much as 84 percent of disease and quality of life. The data also indicate that most of the deaths that occur before age 65 are preventable. In essence, most people in the United States are threatened by the very lives they lead today.

Based on the most recent data available, the average **life expectancy** in the United States is now 76.3 years for men and 81.1 years for women. Based on the WHO data, the United States ranks 28th in the world for life expectancy (see Figure 1.2). Between 2000 and 2010, U.S. male life expectancy slipped from 18th to 24th in the world and

**Figure 1.1** Leading causes of death in the United States: 2011.



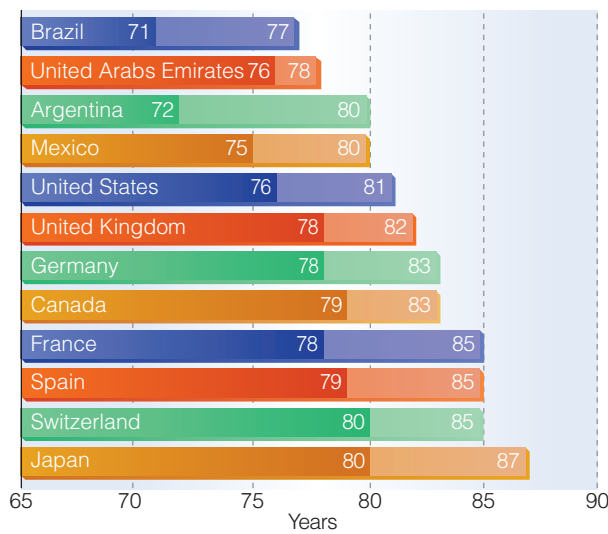
SOURCE: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics reports, *Deaths: Preliminary Data for 2011*, 61:6 (October 10, 2012).



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The epitome of physical inactivity is to drive around a parking lot for several minutes in search of a parking spot 10 to 20 yards closer to the store's entrance.

**Figure 1.2** Life expectancy at birth for selected countries as of December 2012.



\*Dark color is men; light color is women.

SOURCE: United Nations, Social Indicators: Indicators on Health, <http://unstats.un.org/urisd/demographic/products/socind/default.htm>. Download May 20, 2013.

female life expectancy from 28th to 35th. Japan ranks first in the world with an overall life expectancy of 82.6 years.

Several factors may account for the current U.S. life expectancy ranking: the extremely poor health of some groups (such as Native Americans, rural African Americans, and the inner-city poor), the obesity epidemic, the low level of daily physical activity, the high incidence of tobacco use and coronary heart disease, and fairly high levels of violence (notably homicides).

Although life expectancy in the United States gradually increased by 30 years over the past century, scientists from the National Institute of Aging believe that in the coming decades the average life-span may decrease by as much as 5 years. This decrease in life expectancy will be related primarily to the growing epidemic of obesity. About 34 percent of the adult population in the United States is obese. Additional information on the obesity epidemic and its detrimental health consequences is given in Chapter 5.

## 1.2 Importance of Increased Physical Activity

The U.S. surgeon general has stated that poor health as a result of lack of physical activity is a serious public health problem that must be met head-on at once. Regular

moderate physical activity provides substantial benefits in health and well-being for the vast majority of people who are not physically active. For those who are already moderately active, even greater health benefits can be achieved by increasing the level of physical activity.

Among the benefits of regular physical activity and exercise are significantly reduced risks for developing or dying from heart disease, stroke, type 2 diabetes, colon and breast cancers, high blood pressure, and osteoporotic fractures.<sup>3</sup> Regular physical activity also is important for the health of muscles, bones, and joints, and it seems to reduce symptoms of depression and anxiety, improve mood, and enhance one's ability to perform daily tasks throughout life. It also can help control health care costs and maintain a high quality of life into old age.

Moderate physical activity has been defined as any activity that requires an energy expenditure of 150 calories per day, or 1,000 calories per week. The general health recommendation is that people strive to accumulate at least 30 minutes of physical activity a minimum of 5 days per week. Whereas 30 minutes of continuous activity is preferred, on days when time is limited, 3 activity sessions of at least 10 minutes each provide about half the aerobic benefits. Examples of moderate physical activity are walking, cycling, playing basketball or volleyball, swimming, water aerobics, dancing fast, pushing a stroller, raking leaves, shoveling snow, washing or waxing a car, washing windows or floors, and even gardening.

Because of the ever-growing epidemic of obesity in the United States, however, the Institute of Medicine of the National Academy of Sciences increased the recommendation to 60 minutes of moderate-intensity physical activity every day.<sup>4</sup> This recommendation was based on evidence indicating that people who maintain healthy weight typically accumulate one hour of daily physical activity.

Subsequently, the Dietary Guidelines for Americans recommend that up to 60 minutes of moderate- to vigorous-intensity physical activity per day may be necessary to prevent weight gain, and between 60 and 90 minutes of moderate-intensity physical activity daily is recommended to sustain weight loss for previously overweight people.<sup>5</sup>

In sum, although health benefits are derived with 30 minutes per day, people with a tendency to gain weight need to be physically active daily for an hour to an hour and a half to pre-

**Chronic diseases** Illnesses that develop and last over a long time.

**Hypokinetic diseases** Diseases related to a lack of physical activity.

**Life expectancy** Number of years a person is expected to live based on the person's birth year.



vent weight gain. And 60 to 90 minutes of activity per day provides additional health benefits, including a lower risk for cardiovascular disease and diabetes.

## 1.3 2008 Federal Guidelines for Physical Activity

Because of the importance of physical activity to our health, in October 2008 the U.S. Department of Health and Human Services issued Federal Physical Activity Guidelines for Americans for the first time. These guidelines complement the Dietary Guidelines for Americans and further substantiate previous recommendations issued by the American College of Sports Medicine (ACSM) and the American Heart Association (AHA) in 2007<sup>6</sup> and the U.S. surgeon general in 1996.<sup>7</sup> The federal guidelines provide science-based guidance on the importance of being physically active and eating a healthy diet to promote health and reduce the risk of chronic diseases. The federal guidelines include the following recommendations<sup>8</sup>:

### Adults between 18 and 64 years of age

- Adults should do 2 hours and 30 minutes a week of **moderate-intensity aerobic (cardio-respiratory) physical activity**, 1 hour and 15 minutes (75 minutes) a week of **vigorous-intensity aerobic physical activity**, or an equivalent combination of moderate- and vigorous-intensity aerobic physical activity (also see Chapter 3). When combining moderate- and vigorous-intensity activities, a person could participate in moderate-intensity activity twice a week for 30 minutes and high-intensity activity for 20 minutes on another two days. Aerobic activity should be performed in episodes of at least 10 minutes long each, preferably spread throughout the week.
- *Additional health benefits* are provided by increasing to 5 hours (300 minutes) a week of moderate-intensity aerobic physical activity, 2 hours and 30 minutes a week of vigorous-intensity physical activity, or an equivalent combination of both.
- Adults should also do muscle-strengthening activities that involve all major muscle groups, performed on two or more days per week.

### Older adults (ages 65 and older)

- Older adults should follow the adult guidelines. If this is not possible due to limiting chronic conditions, older adults should be as physically active as their abilities allow. They should avoid inactivity. Older adults should do exercises that maintain or improve balance if they are at risk of falling.

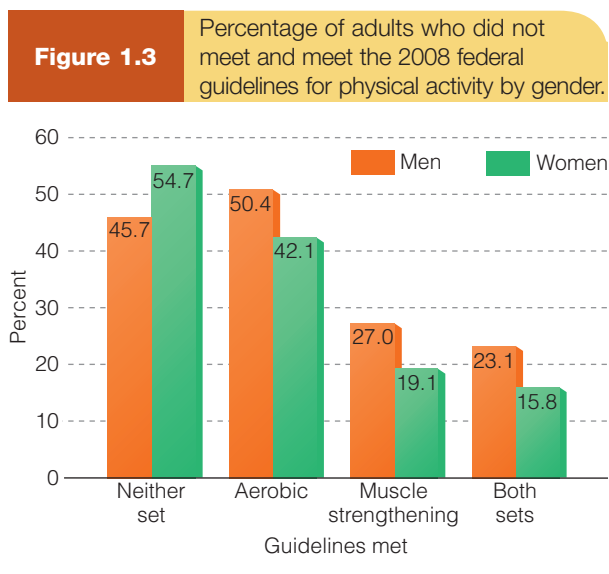
### Children 6 years of age and older and adolescents

- Children and adolescents should do 1 hour (60 minutes) or more of physical activity every day.
- Most of the 1 hour or more a day should be either moderate- or vigorous-intensity aerobic physical activity.
- As part of their daily physical activity, children and adolescents should do vigorous-intensity activity on at least three days per week. They also should do muscle-strengthening and bone-strengthening activities on at least three days per week.

### Pregnant and postpartum women

- Healthy women who are not already doing vigorous-intensity physical activity should get at least 2 hours and 30 minutes (150 minutes) of moderate-intensity aerobic activity a week. Preferably, this activity should be spread throughout the week. Women who regularly engage in vigorous-intensity aerobic activity or high amounts of activity can continue their activity provided that their condition remains unchanged and they talk to their health care provider about their activity level throughout their pregnancy.

The most recent data released in 2013 by the Centers for Disease Control and Prevention (CDC) indicate that only 19.4 percent of U.S. adults ages 18 and older meet the federal physical activity guidelines for both aerobic and muscular fitness (strength and endurance) activities, whereas 46.1 percent meet the guidelines for aerobic fitness and just 23 percent do so for muscular fitness. An-



SOURCE: [http://www.cdc.gov/nchs/data/series/sr\\_10/sr10\\_257.pdf](http://www.cdc.gov/nchs/data/series/sr_10/sr10_257.pdf) (downloaded July 9, 2013)

other 34 percent of Americans are completely inactive during their leisure time (Figure 1.3).

The previous 2007 ACSM and AHA joint statement on physical activity recommendations for healthy adults states that a greater amount of physical activity that exceeds the minimum recommendations (given above) provides even greater benefits. Such an exercise prescription is recommended for individuals who wish to further improve personal fitness, reduce the risk for chronic disease and disabilities, prevent premature mortality, or prevent unhealthy weight gain.<sup>9</sup>

In conjunction with the above report, the ACSM and the American Medical Association (AMA) have launched a nationwide *Exercise is Medicine* program.<sup>10</sup> The goal of this initiative is to help improve the health and wellness of the nation through exercise prescriptions from physicians and health care providers: “Exercise is medicine and it’s free.” All physicians should be prescribing exercise to all patients and should participate in exercise themselves. Exercise is considered to be the much-needed vaccine of our time to prevent chronic diseases. Physical activity and exercise are powerful tools for both the treatment and prevention of chronic diseases and premature death.

### Critical Thinking

Do you consciously incorporate physical activity into your daily lifestyle? • Can you provide examples? • Do you think you get sufficient daily physical activity to maintain good health?

## 1.4 Wellness

After the initial fitness boom swept across the United States in the 1970s, it became clear that improving physical fitness alone was not always enough to lower the risk for disease and ensure better health. For example, individuals who run three miles a day, lift weights regularly, participate in stretching exercises, and watch their body weight can be classified as having good or excellent fitness. If these same people, however, have high blood pressure, smoke, are under constant stress, consume too much alcohol, and eat too many fatty and processed foods, they are exposing themselves to **risk factors** for disease of which they may not be aware.

Good health no longer is viewed as simply the absence of disease. The notion of good health has evolved notably in the past few years and continues to change as scientists learn more about lifestyle factors that bring on illness and affect wellness. Once the idea took hold that fitness by itself would not necessarily decrease the risk

**Figure 1.4** Dimensions of wellness.



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for disease and ensure better health, the wellness concept developed in the 1980s.

**Wellness** is an all-inclusive umbrella covering a variety of health-related factors. A wellness lifestyle requires the implementation of positive programs to change behavior and thereby improve health and quality of life, prolong life, and achieve total well-being. To enjoy a wellness lifestyle, a person has to practice behaviors that will lead to positive outcomes in seven dimensions of wellness: physical, emotional, intellectual, social, environmental, spiritual, and occupational (Figure 1.4). These dimensions are interrelated; one frequently affects the others. For example, a person who is “emotionally down” often has no desire to exercise, study, go to work, socialize with friends, or attend church.

The concept behind the seven dimensions of wellness shows that high-level wellness clearly goes beyond optimum fitness and the absence of disease. Wellness incorporates fitness, proper nutrition, stress management, disease prevention, social support, self-worth, nurturance (a sense of being needed), spirituality, personal safety, substance control

**Moderate-intensity aerobic physical activity** Defined as the equivalent of a brisk walk that noticeably increases the heart rate.

**Vigorous-intensity aerobic physical activity** Defined as an activity similar to jogging that causes rapid breathing and a substantial increase in heart rate.

**Risk factors** Characteristics that predict the chances for developing a certain disease.

**Wellness** The constant and deliberate effort to stay healthy and achieve the highest potential for well-being.

and not smoking, regular physical examinations, health education, and environmental support.

For a wellness way of life, individuals must be physically fit and manifest no signs of disease, and they also must avoid all risk factors for disease (such as physical inactivity, hypertension, abnormal cholesterol levels, cigarette smoking, excessive stress, faulty nutrition, or careless sex). Even though an individual tested in a fitness center might demonstrate adequate or even excellent fitness, indulgence in unhealthy lifestyle behaviors will increase the risk for chronic diseases and decrease the person's well-being. Additional information on wellness and how to implement a wellness program is given in Chapter 8.

Unhealthy behaviors contribute to the staggering U.S. health care costs. Risk factors for disease carry a heavy price tag. Health care costs in the United States rose from \$12 billion in 1950 to \$2.3 trillion in 2008, or about 16 percent of the gross domestic product (GDP). In 1980, health care costs represented 8.8 percent of the gross national product (GNP), and they are projected to reach about 20 percent by the year 2015. Based on estimates, 1 percent of Americans account for 30 percent of these costs. Half of the people use up about 97 percent of the health care dollars.

In terms of yearly health care costs per person, the United States spends more per person than any other industrialized nation. U.S. health care costs per capita are above \$8,200 per year. Overall, the U.S. health care system ranks only 37th in the world.

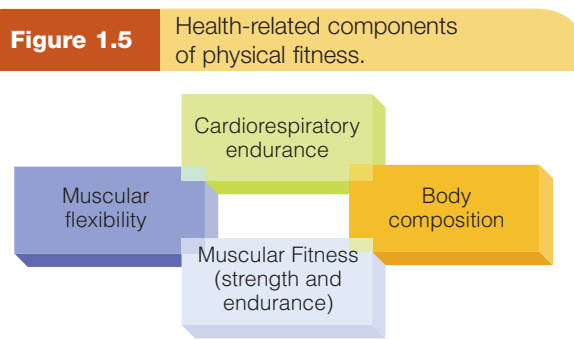
One of the reasons for the low overall ranking is the overemphasis on state-of-the-art cures instead of prevention programs. The United States is the best place in the world to treat people once they are sick, but the system does a poor job of keeping people healthy in the first place.

## 1.5 Physical Fitness

Individuals are physically fit when they can meet both the ordinary and the unusual demands of daily life safely and effectively without being overly fatigued and still have energy left for leisure and recreational activities. **Physical fitness** can be classified into health-related and skill-related fitness.

**1.5A Health-Related Fitness** Health-related fitness has four components: cardiorespiratory endurance, muscular fitness, muscular flexibility, and body composition (see Figure 1.5).

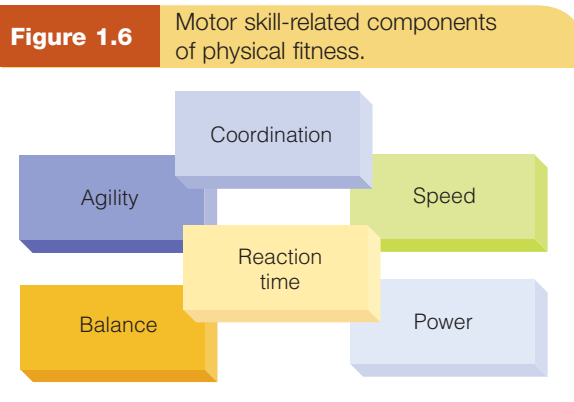
1. *Cardiorespiratory endurance*: the ability of the heart, lungs, and blood vessels to supply oxygen to the cells to meet the demands of prolonged physical activity (also referred to as aerobic exercise).



2. *Muscular fitness (muscular strength and muscular endurance)*: the ability of the muscles to generate force.
3. *Muscular flexibility*: the achievable range of motion at a joint or group of joints without causing injury.
4. *Body composition*: the amount of lean body mass and adipose tissue (fat mass) in the human body.

**1.5B Skill-Related Fitness** Fitness in motor skills is essential in activities such as basketball, racquetball, golf, hiking, soccer, and water skiing. Good skill-related fitness also enhances overall quality of life by helping people cope more effectively in emergency situations (see Chapter 4). The components of **skill-related fitness** are agility, balance, coordination, power, reaction time, and speed (see Figure 1.6).

1. *Agility*: the ability to change body position and direction quickly and efficiently. Agility is important in sports such as basketball, soccer, and racquetball, in which the participant must change direction rapidly and at the same time maintain proper body control.
2. *Balance*: the ability to maintain the body in equilibrium. Balance is vital in activities such as gymnas-



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tics, diving, ice skating, skiing, and even football and wrestling, in which the athlete attempts to upset the opponent's equilibrium.

3. **Coordination:** integration of the nervous system and the muscular system to produce correct, graceful, and harmonious body movements. This component is important in a wide variety of motor activities such as golf, baseball, karate, soccer, and racquetball, in which hand-eye or foot-eye movements, or both, must be integrated.
4. **Power:** the ability to produce maximum force in the shortest time. The two components of power are speed and force (strength). An effective combination of these two components allows a person to produce explosive movements such as required in jumping; putting the shot; and spiking, throwing, and hitting a ball.
5. **Reaction time:** the time required to initiate a response to a given stimulus. Good reaction time is important for starts in track and swimming; for quick reactions when playing tennis at the net; and in sports such as pingpong, boxing, and karate.
6. **Speed:** the ability to propel the body or a part of the body rapidly from one point to another. Examples of activities that require good speed for success are soccer, basketball, stealing a base in baseball, and sprints in track.

In terms of preventive medicine, the main emphasis of fitness programs should be on the health-related components. Skill-related fitness is crucial for success in sports and athletics, and it also contributes to wellness. Improving skill-related fitness affords an individual more enjoyment and success in lifetime sports, and regular participation in skill-related fitness activities also helps



Good skill-related fitness enhances success in sports performance.

develop health-related fitness. Further, total fitness is achieved by taking part in specific programs to improve health-related and skill-related components alike.

## 1.6 Benefits of Physical Fitness

The benefits to be enjoyed from participating in a regular fitness program are many. In addition to a longer life (see Figures 1.7 and 1.8), the greatest benefit of all is that physically fit people who lead a positive lifestyle have a healthier and better quality of life. These people live life to its fullest and have fewer health problems than inactive individuals who also indulge in negative lifestyle habits. Compiling an all-inclusive list of the benefits to be reaped through participation in a fitness program is a challenge, but the list provided in Table 1.1 summarizes many of these benefits.

In addition to the benefits listed in Table 1.1, **epidemiological** research studies linking physical activity habits and mortality rates have shown lower premature mortality rates in physically active people. Pioneer work in this area demonstrated that, as the amount of weekly physical activity increased, the risk of cardiovascular deaths decreased.<sup>11</sup> In this study, conducted among 16,936 Harvard alumni, the greatest decrease in cardiovascular deaths was observed in alumni who burned more than 2,000 calories per week through physical activity.

A landmark study subsequently upheld the findings of the Harvard alumni study.<sup>12</sup> Based on data from 13,344 individuals who were followed over an average of 8 years, the results confirmed that the level of cardiorespiratory fitness is related to mortality from all causes. These findings showed a graded and consistent inverse relationship between physical fitness and mortality, regardless of age and other risk factors.

In essence, the higher the level of cardiorespiratory fitness, the longer the life (see Figure 1.7). The death rate from all causes for the low-fit men

**Physical fitness** The general capacity to adapt and respond favorably to physical effort.

**Health-related fitness** A physical state encompassing cardiorespiratory endurance, muscular strength and endurance, muscular flexibility, and body composition.

**Skill-related fitness** Components of fitness important for successful motor performance in athletic events and in lifetime sports and activities.

**Epidemiological** The study of epidemic diseases.